ORIGINAL

Before the

FEDERAL COMMUNICATIONS COMMISSION

Washington, DC 20554

In the Matter of	)	
	)	
Amendment of Part 87 of the	)	WT Docket No. 96-1
of the Commission's Rules to	)	RM-8495
Permit Automatic Operation of	)	
Aeronautical Advisory Stations (Unicoms)	)	

COMMENTS OF THE
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Potomac Aviation Technology Corporation (PATC) hereby submits its comments in the above-captioned proceeding. PATC believes that automated unicom systems will substantially improve the quality and timeliness of critical advisory information to general aviation pilots, thereby improving the safety of life and property in flight, and increasing the communications capabilities of general aviation in a spectrum-efficient manner. PATC congratulates the Commission on its recognition of the importance of this new technology, and applauds the Commission's efforts to make this technology available to the American flying public.

BACKGROUND

PATC has been developing the state of the art in automated unicom systems for three years at Potomac Airfield, a busy general aviation airfield south of Washington, DC. The airfield has over 70,000 aircraft

operations, defined as take-offs or landings, per year, including three flight schools and a high volume of general aviation traffic. Superunicom, PATC's automated advisory system, was originally conceived and designed for airfields of this type throughout the United States and the world, and experience has shown that Superunicom technology answers the communications needs of such airfields with greater effectiveness and efficiency than any other technology currently available, while remaining affordable to most general aviation airfields.

General aviation communications in the United States are conducted primarily via aeronautical advisory stations (unicoms). These unicoms are typicaly located on general aviation airfields, and are used to provide weather advisory information, information on available aircraft such as fuel, and, on an ancillary basis, information on the availabilty of such services as food, lodging, and ground transportation. Eight frequencies in the VHF aviation band are available in the United States for unicoms. At most general aviation airfields, unicoms are the only means of two-way communications between pilots and the airfield.

In the late 1970s, the Federal Aviation Administration (FAA) envisioned the possibility of providing weather advisory information over already assigned or available unicom frequencies at airports around the country. The FAA concluded that systems which provide standardized weather observations in response to pilots keying their microphones (clicking) caused unacceptable levels of interference to normal unicom communications.

During the three years that PATC has been developing Superunicom, we have amassed an enormous amount of data on all RF transmissions on unicom frequencies, as well as extensive experience on unicom communications patterns in various locations. PATC's Superunicom technology has retained an archival history af all detectable RF transmissions on the unicom frequencies at several different airfields, recording

date, time, duration, and type of every RF transmission on the unicom frequency at each airfield. PATC has used this information to refine and improve the intelligence, pattern recognition capability, and adaptive behaviour of Superunicom to the point where it now repeatedly demonstrates its ability to be well-mannered on an airfield's unicom frequency sharing with other ground-to-air and inter-pilot communications.

PATC's extensive research, development, and field experience in unicom operations leads to the conclusion that a successful, non-interfering automated unicom system must adapt to the levels of air traffic and frequency congestion present at any time, and must prioritize advisory information from sensors and deliver the minimum information necessary, according to the current conditions, time, and amount of traffic on the frequency.

In developing the Superunicom PATC has enjoyed the support and guidance from all of the major trade groups and users relevant to the use of unicom services. These include written positions of support from the Aircraft Owners and Pilots Association (AOPA), National Business Aircraft Association (NBAA), General Aviation Manufacturers Association (GAMA), the FAA, and others. The issuance of a developmental license by the FCCs own Aviation and Marine and Licensing Branches has been instrumental in providing the opportunity to expose and thereby refine this new technology to a high standard of reliability. The cooperation between all of these agencies and trade groups has resulted in a technology that has demonstrated a significant improvement in flight safety. Therefore, PATC offers that its comments below should be considered as very well qualified.

The Commission's Rules should be amended to permit the operation of automated unicom stations.

In its Petition, PATC noted the many sound public safety, technical, and economic reasons for amendment of the Commission's Rules to allow the use of automated unicom systems such as Superunicom. We feel that a brief reiteration will serve as a good basis for these comments.

As a matter of public safety policy, Superunicom is on duty 24 hours per day, prepared to provide critical advisory information to pilots. It does not sleep, eat, get called away from its desk, read magazines, perform other work tasks, or any of the things which naturally distract the human unicom operator from the primary task of unicoms; supporting the safety of life and property in flight by providing accurate and timely weather, runway conditions, special circumstances, and Notices to Airmen (NOTAMS).

Technically, Superunicom is often superior to human unicom opertors in that it does not misread weather data; is not poorly trained in the information needs of pilots, as ground personnel at small airfields may be; and provides radio checks that allow the pilot to hear the strength of transmission directly, rather than depending on the opinion of a stranger as to the hearability and readability of transmissions. At the same time, Superunicom does not prevent human unicom operators from using the unicom station, when special circumstances call for a flexible dialog.

Economically, Superunicom is a boon to general aviation airfields, which typically operate on very small profit margins. An airfield that cannot afford staff for the unicom around the clock, or even for two shifts, can use Superunicom to fill the hours when no other unicom communications are available. This allows airfields to offer operations before and after fully-staffed operational hours, to the economic benefit of the field. In many cases, this could be the difference between reasonable economic health and life on the edge of bankruptcy for many struggling airfields.

In sum, PATC's Superunicom is an example of the use of technology within a long-established radio service to improve the efficiency, effectiveness, and reliability of that service. Because automated unicom technology has proven its virtues in a developmental environment, and because reviews of the technology from knowledgeable parties are uniformly approving, the Commission should amend its Rules to allow this advance in the state of the art in general aviation communications.

COMMENTS ON PROPOSED RULES

The Commission should modify proposed 87.219(b)(1).

The proposed language would require automated unicom stations to monitor unicom traffic, and to transmit only when no detectable signals are received for at least three seconds. The clear intent of the proposed rule is to ensure that automated unicoms do not interfere with other traffic on the frequency. PATC believes, however that the proposed language raises two problems:

The first problem arises from the fact that, when another party using the frequency has completed their transmission, it becomes obvious that only one of two conditions exists:

1) An immediate response is expected, e.g.,

   TRANSMISSION *"Cessna 86121 requesting winds at Potomac..."*

   RESPONSE *"Winds at Potomac are 240 at 13."*

Or:

2) The frequency is now clear for the next speaker, e.g,

   TRANSMISSION *"Cessna 86121 is clear of the active runway."*

When a request is made and an immediate response is expected, as is customary, all other users of the frequency will remain silent until the expected response has been provided. This is both common courtesy and common practice. Thus, the introduction of an unnatural pause when a response is clearly expected will inadvertently deny the use of the frequency by others until the response is given, e.g.,

TRANSMISSION	*"Cessna 86121 Requesting winds at Potomac..."*
Pause	(None may use the frequency)
Pause	(None may use the frequency)
Pause	(None may use the frequency)

For the efficient use of scarce time on the frequency it is imperative that when a specific request is made, that the response immediately follow the request. Even under conditions where the frequency is so congested that a response must be deferred, a short but immediate response is customary and required to maintain the natural flow of communications. Any unnatural three-second pause even under these circumstances is wasteful of time on the frequency.

OTHER USER	*"Piper 456SF turning final 24 Potomac"*
INQUIRY	*"Cessna 86121 Requesting winds at Potomac..."*
INITIAL RESPONSE	*"Please standby"*
OTHER USER	*"Piper 456SF short final 24 Potomac"*
DELAYED RESPONSE	*"....Winds at Potomac are 240 at 14 peak 18"*

The second problem with the language as proposed, based on PATC's historical data of RF transmissions on unicom, shows that there is a considerable amount of background transient noise often present. While this noise is irrelevant to local unicom operations, it technically is a detectable RF signal. An automated unicom must have the intelligence to distinguish between transient noise, intentional communications, and intentional "click" activation, and to respond correctly under all circumstances. But as the rule is currently written, these transient "signals" would delay automated unicom transmissions by three seconds, even though the "signals" are irrelevant to unicom communications.

PATC believes that a minor change to 87.219(b)(1) will serve the goal of preventing interference from automated unicoms to other unicom traffic, while avoiding the waste of time and communications efficiency in the two situations outlined above. These concerns can be resolved by changing the section to read:

> **(1) Monitor the unicom frequency prior to transmission, and transmit only when no detectable *communications* are received for at least three seconds, *or in response to specific requests for information*.**

Replacing "signals" with "communications" allows a sufficiently intelligent automated system to ignore transient, non-communications signals, and the clause allowing responses to specific requests emulates the ordinary flow of human-operated unicom traffic, while at the same time ensuring that an automated unicom does not transmit unwanted information to the detriment of other unicom communications.

Relatively unintelligent automated systems would be required to wait the full three seconds in all cases, and intelligent systems capable of recognizing information requests and discriminating between communications

and non-communications signals would be allowed faster response times, and would benefit unicom communications by rewarding the use of advanced systems, which give better information as well as faster response.

The Commission should modify proposed 87.219(b)(2) to allow response to incoming calls.

The proposed 87.219(b)(2) allows automated unicom systems to respond only to brief clicks from the aircraft transmitter. This provision appears to be designed to prevent automated unicoms from occupying the unicom frequency when not interrogated by pilots seeking information. While PATC agrees with the necessity of such a restriction, we point out that the rule section can prevent overuse of the unicom frequency by automated systems, without foreclosing the opportunities of current and near-future technology to make automated unicom systems sensitive to other interrogation methods than clicks.

While the current technology of speaker independent voice recognition is not yet practical for aviation communications, it would be wise to not inadvertently preclude its application. PATC has already demonstrated a reliable near equivalent system that uses pattern recognition of RF transmissions to respond intelligently and appropriately under highly variable conditions of frequency use and weather sensor data.

While in the process of accumulating extensive data on RF unicom transmissions it became apparent to PATC that there are many patterns of communications other than "clicks" that offered an opportunity for automated systems to intelligently provide relevant and often critical information. For example, using pattern recognition of RF unicom communications, Superunicom can reliably distinguish the relative number of aircraft using the frequency within a given airport area and thereby modify its transmissions based on air traffic volume.

OTHER TRAFFIC PRESENT	*"For Runway, Listen for Traffic"*
NO OTHER TRAFFIC PRESENT	*"For Runway, Pilots Discretion"*

This capability allows the system to alert inbound aircraft that have just tuned to the unicom frequency to the presence of other aircraft already within the traffic pattern. Similarly the PATC has demonstrated that it Superunicom recognizes the standard "blind" call to traffic, made by an inbound aircraft to announce the aircraft's position and intentions. In this case the automated unicom responds with an airfield identifier, automated unicom instructions, and any critical NOTAMs such as runway closures, snow removal equipment on the runways, unmarked air hazards, etc.

INBOUND AIRCRAFT'S "BLIND" CALL ON UNICOM	*"Potomac traffic, N86121 inbound from the south, request advisories, anyone in the pattern?"*
SUPERUNICOM RESPONSE	*"Potomac Airfield, automated unicom, enter 3 clicks for advisory, 4 clicks for radio-check. Caution, Runway 31 is closed due to construction."*

These features represent proven technology that already exceeds the limitation of responding only to simple clicks. Because pattern recognition has already demonstrated that automated unicoms can provide useful and sometimes critical information in response to transmission patterns other than simple clicks, PATC suggests

that the language of 87.219(b)(2) be modified to provide for this already proven technology, as well as for predictable future advances in pattern-recognition software. We suggest a section reading:

> **(2) Transmit only in response to *communications* or brief keyed RF signals from aircraft stations as specified in 87.187(y).**

This language maintains the limitation on automated unicom systems to responses to pilots, while also avoiding placing obstacles in the way of advancing technology.

> The Commission should modify the requirements of proposed 87.219(c) to ensure that automated unicom transmissions are as brief and accurate as possible.

PATC's field experience has shown that the unqualified brevity of unicom transmissions is less important than having the ability to prioritize information, and to then select which information is appropriate and relevant given the use of the frequency by others at the time the information was requested. For example, during busy times PATC's Superunicom system may shorten its entire advisory broadcast to less than 5 seconds. If, for example, windshear is present, some brevity is lost when the system adds an important windshear alert, bringing the transmission up to approximately 7 seconds in length. PATC proposes that the FCC expand the definition of "as brief as possible" and proposes below language that may better reflect the intent of the FCC's proposal.

As early as the late 1970's the Federal Aviation Administration considered using airport unicom frequencies as an outlet for Automated Weather Observation System (AWOS) information, but found in practice that simply

responding to pilot requests with the standard and lengthy weather observation caused unacceptable interference on busy unicom frequencies.

To preclude interference on unicom frequencies it is essential that any automated unicom be able to emulate a knowledgeable human unicom operator by adapting the length and content of advisory broadcasts to the most relevant information that is appropriate given the level of frequency congestion at the time. This capability was specifically cited in the FAA recommendation to the FCC developmental authorization of PATC's automated unicom in the Cusimano letter of October, 1994; wherein the FAA states "The SuperUnicom system sufficiently emulates existing and approved UNICOM/CTAF services."

For an automated unicom to be well-mannered and non-interfering the system must be able to continuously prioritize sensor information based on the relevance of the information to flight operations given the current conditions. This requires the automated unicom to reduce or expand the advisory broadcast to include all of the most critical information, and perhaps more importantly, to transmit only the most important information during times of high frequency congestion. This ability to prioritize and adapt is the critical ingredient necessary for automated systems to share the use of a frequency with others without causing interference.

For example: An automated unicom should be able to determine when temperature and dewpoint values are important and should be given in an advisory, and equally important when these values are relatively insignificant and need not be given. When the temperature dewpoint difference is narrow and the winds are calm, the possibility of ground fog exists; thus the temperature and dewpoint values and the conclusion from these values is important and they must be contained in an advisory. When the temperature/dewpoint spread

is great, and thus their values becomes less relevant, tying up the frequency during congested times to give these values would cause unnecessary harmful interference.

An effective system, capable of adapting its advisory information must be aware of the level of frequency use by others. Such systems must continuously monitor the frequency and make determinations as to how busy the frequency is, they must be able to identify when the frequency is clear for transmission and the length of transmission appropriate to the current levels of frequency use. Thus, when the frequency is quiet, an automated unicom transmission may be 18 seconds in length:

> *"Potomac Airfield, Automated Advisory, Temperature 68, Dewpoint 63, Wind 240 at 3, Caution, Possible ground fog, Altimeter 29.92, Notice to Airmen, Noise abatement procedures in effect two miles to the North, from 0600 to 2200 local time."*

When the frequency is heavily congested the same would be reduced to 5 seconds, having only the essentials necessary for landing:

> *"Potomac Airfield, Automated Advisory, Wind 240 at 3, Altimeter 29.92."*

PATC's SuperUnicom has been demonstrated to have this capability. PATC offers below language that would set this adaptive requirement for all automated unicoms to preclude overly simple systems from interfering with unicom communications.

The addition of date and time stamps to unicom transmissions would tie up critical transmission time on a busy shared unicom frequency causing confusion and unnecessary interference to provide irrelevant information. There are at least three clear reasons why date time stamps are inappropriate on unicom, regardless of whether provided by a human or automated system:

1) The standard phraseology for unicom advisories must be maintained for pilots to understand the information given. Adding unnatural and unexpected phraseology will unquestionably cause confusion and re-transmissions of misunderstood information.

2) As with the instructions from an air-traffic controller, it is commonly understood that unicom advisory information ALWAYS reflects current conditions and suggested actions. Out of date information is never appropriate and never given.

3) The remote access of information from Automated Weather Observation Systems (AWOS), Automated Surface Observation Systems (ASOS), and Air Terminal Information Systems (ATIS) is only updated once per hour and is therefore ALWAYS out of date for the remaining 59 minutes until the next hourly update is done. While date and time stamps alert pilots to the out-of-date nature of AWOS, ASOS and ATIS information, with unicom this is never the case.

PATC proposes language that better defines the intention of brevity, sets a specific requirement that will preclude interference, does not preclude important information, and which addresses the concerns of date and time stamps:

(c) Automated advisory transmissions must be as brief as possible, *adapting to the level of congestion on the unicom frequency, and must contain only current advisory information.*

This language recognizes the commonly accepted, real-time nature of all unicom operations; precludes the possibility of pilots being given out-of-date information; and eliminates unnecessarily tying up scarce time on the unicom frequency providing irrelevant information including the current date and time. This language would also allow important NOTAM messages, which may be continuous conditions, to be appended to the advisory transmission when frequency congestion permits.

CONCLUSION

Automated unicom systems are a new technology with the potential to bring safety, technological, and economic benefits to general aviation and the American public. The Commission should move as quickly as possible to make such systems a part of the aviation communications structure in the United States. As the manufacturer of the only non-Government automated advisory system, the holder of several patents involved in creating the system, and the organization with the greatest experience and research base in unicom operations, PATC submits the above suggestions for modification of the proposals contained in the Notice of Proposed Rule Making. We feel that, with these modifications, amendment of the Commission's Rules will allow a rapid upgrade of general aviation communications capabilities throughout the United States.

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